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Do Race, Ethnicity, and Psychiatric Diagnoses Matter in the Prevalence of Multiple Chronic Medical Conditions?

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Abstract

Background—The proportion of people in the United States with multiple chronic medical conditions (MCMC) is increasing. Yet, little is known about the relationship that race, ethnicity, and psychiatric disorders have on the prevalence of MCMCs in the general population.

Methods—This study used data from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (N= 33,107). Multinomial logistic regression models adjusting for socio-demographic variables, body mass index, and quality of life were used to examine differences in the 12-month prevalence of MCMC by race/ethnicity, psychiatric diagnosis, and the interactions between race/ethnicity and psychiatric diagnosis.

Results—Compared to non-Hispanic Whites, Hispanics reported lower odds of MCMC and African Americans reported higher odds of MCMC after adjusting for covariates. People with psychiatric disorders reported higher odds of MCMC compared to people without psychiatric disorders. There were significant interactions between race and psychiatric diagnosis associated with rates of MCMC. In the presence of certain psychiatric disorders, the odds of MCMC were higher among African Americans with psychiatric disorders compared to non-Hispanic Whites with similar psychiatric disorders.

Conclusions—Our study results indicate that race, ethnicity, and psychiatric disorders are associated with the prevalence of MCMC. As the rates of MCMC rise, it is critical to identify which populations are at increased risk and how to best direct services to address their health care needs.

The proportion of people in the U.S. with multiple chronic medical conditions (MCMC, e.g., diabetes, hypertension) is increasing and creating a serious burden on our health care system. Chronic medical conditions are defined as those that limit a person's functioning, last a year or more, and require ongoing medical care.¹ It is estimated that 75 million Americans have two or more chronic medical conditions.² This number is expected to reach 81 million by 2020 with the aging of the U.S. population.³ MCMC are associated with adverse health outcomes, including poor functional status, unnecessary hospitalizations, adverse drug events, duplicative tests, and higher mortality.^{2,4} MCMC are also costly. Average per capita health care spending increases exponentially with the number of chronic

medical conditions from \$1,081 for people with no chronic conditions to \$5,074 for two conditions to \$14,768 with five or more conditions.²

The rates of chronic medical conditions are disproportionately higher among racial/ethnic minority groups in the U.S. Compared to non-Hispanic Whites, Hispanics and African Americans have elevated prevalence of hypertension and kidney disease,⁵ diabetes⁶, and asthma.⁷ These groups also experience marked disparities in the quality of medical care and higher morbidity and mortality due to these chronic illnesses.⁸

People with psychiatric disorders are also at increased risk for chronic medical conditions. Depressive and anxiety disorders commonly co-occur with diabetes^{9,10} and cardiovascular disease.¹¹ People with serious mental illnesses and substance use disorders are at elevated risk for chronic medical conditions, including cardiovascular disease, diabetes, and pulmonary disease.^{12,13} The links between chronic medical conditions and psychiatric disorders are complex and bidirectional, suggesting that “medical conditions may lead to mental disorders, mental conditions may place a person at risk for medical disorders and mental and medical disorders may share common risk factors.”^{14,p.6} Multiple pathways have been proposed for these complex relationships, including inflammatory factors associated with brain functioning, adverse life events, negative health behaviors (e.g., smoking), and difficulties adhering to medical regimens.^{10,15,16}

Despite the fact that racial/ethnic minority status and psychiatric disorders are independent risk factors for chronic medical conditions, no study to date has examined the relationships between race/ethnicity, psychiatric disorders, and their interactions to the prevalence of MCMC using a nationally representative community sample. The few studies in this area tend to use clinical samples or medical claims data and have found that compared to non-Hispanic Whites with common psychiatric disorders African Americans and Hispanics with similar psychiatric disorders report higher prevalence of obesity, diabetes, and cardiovascular disease.¹⁷⁻¹⁹ These findings suggest that racial/ethnic minority status and the presence of psychiatric disorders may interact in complex ways increasing the risk of chronic medical conditions.

A growing body of work suggests that social determinants outside the formal health system, such as poverty, discrimination, and the social environment, may contribute to the poor -- health of disadvantaged groups.²⁰ For example, African Americans, Hispanics, and people with psychiatric disorders are more likely than the general population to be poor --as a result, they face numerous structural and environmental barriers to receiving high-quality medical care and engaging in healthy lifestyles.^{8,21} All three groups may face stigma and discrimination. However, it is not clear how having more than one form of social disadvantage --having both a psychiatric disorder and being a racial/ethnic minority - may affect the prevalence of MCMC when they are present in the same individual.

In the present study, we use data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) to compare MCMC rates between non-Hispanic White, Hispanic, and African American adults with and without common psychiatric disorders. We also examine the interactions between race/ethnicity and psychiatric disorders on the rates of MCMC to test whether racial/ethnic minorities with psychiatric disorders are at increased risk for MCMC than non-Hispanic Whites with similar psychiatric diagnoses, and how that relationship varies across psychiatric diagnoses and particular racial/ethnic groups.

METHODS

Sample

Data was drawn from the 2004–2005 Wave 2 sample of the NESARC. A detailed description of the Wave 1 and 2 methodologies is reported elsewhere.^{22,23} The NESARC is based on a nationally representative sample of the U.S. non-institutionalized population 18 years of age or older who reside in households and group quarters (e.g., group homes) throughout the 50 states and the District of Columbia. African Americans, Hispanics, and adults ages 18–24 were oversampled, with data adjusted for oversampling, household- and person-level non-response. All procedures, including informed consent, received full human subjects review and approval from the U.S. Census Bureau and U.S. Office of Management and Budget.

Wave 1 of the NESARC surveyed 43,093 respondents with a response rate of 81%.²⁴ Respondents from Wave 1 who were deceased (n=1,403), deported, mentally or physically impaired (n=781) or on active military duty (n=950) were ineligible to be re-interviewed in Wave 2.²⁵ The total sample for the present study included the 33,107 respondents who were re-interviewed in Wave 2 and were non-Hispanic White, Hispanic or African American. Sample weights are described elsewhere²⁵ and were successful in adjusting for nonresponse, socio-demographics, and psychiatric diagnoses factors ensuring that the sample approximates the target population. Weighted data were adjusted to be representative of the U.S. civilian population based on estimates from the 2000 census.

Measures

Psychiatric assessment—Diagnostic assessments of past-year mood, anxiety, and substance use disorders were derived from the Alcohol Use Disorder and Associated Disabilities Interview Schedule: DSM-IV (AUDADIS-IV), Wave 2 version.²² The AUDADIS-IV is a structured diagnostic interview designed for use by lay interviewers in large-scale surveys.^{22,26} Previous studies indicate that the AUDADIS-IV measures for mood, anxiety, and substance use disorders show adequate reliability (e.g., test-retest) and validity (e.g., convergent, construct) among general population samples and racial/ethnic minority groups.^{27–29}

We used aggregate variables for any mood disorders, any anxiety disorders, and any substance use disorders in the past 12 months. Any mood disorders included major depressive disorder, dysthymia, bipolar I, and bipolar II. Any anxiety disorders included generalized anxiety disorder, panic disorder (with or without agoraphobia), social anxiety disorder, specific phobia, and posttraumatic stress disorder. Mood and anxiety disorders that were substance-induced or caused by a general medical condition or bereavement were excluded. Any substance use disorders included abuse and/or dependence for alcohol and/or 11 classes of drugs: sedatives, tranquilizers, nicotine, opiates (other than heroin or methadone), stimulants, hallucinogens, cannabis, cocaine (including crack cocaine), inhalants/solvents, heroin, and other drugs. Consistent with previous studies,^{30,31} a global indicator of any psychiatric disorder was developed that included the presence of any of the disorders presented above.

Chronic medical conditions—The AUDADIS-IV section assessing medical conditions was used to develop indicators for seven common chronic medical conditions: cardiovascular disease (CVD; defined as hardening of the arteries or arteriosclerosis; chest pain or angina pectoris; rapid heartbeat or tachycardia; heart attack or myocardial infarction; stroke and/or any other form of heart disease), diabetes, high cholesterol, high blood pressure/hypertension, liver disease, gastritis/stomach ulcer, and arthritis. The presence of

these conditions was determined by two questions. Participants were first asked whether they had a particular medical condition in the last 12 months. If they answered “yes”, they were asked whether this diagnosis was confirmed by a doctor or other health professional. Those responding “yes” to both questions were categorized as having the medical condition in question. We used these responses to create an MCMC variable to categorize each participant into three mutually exclusive groups: no chronic medical condition, one chronic medical condition, or two or more chronic medical conditions. This categorical variable is consistent with published studies^{32,33} and served as our main dependent variable.

We used self-reported height and weight to compute participants’ body mass index (BMI) by dividing weight in kilograms by the square of height in meters. Participants were classified into one of four groups: underweight (BMI < 18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), and obese (BMI ≥ 30). We used the Short Form Health Survey (SF-12)³⁴ component scores to describe patients’ health and mental health-related quality of life. These scores range from 0 to 100 with higher scores representing better functioning and quality of life.

Socio-demographics—Socio-demographic variables included gender, age, marital status, education, and annual family income. Race and ethnicity were determined by self-identification. Three groups were included: non-Hispanic Whites (n = 20,161), Hispanics (n = 6,359), and African Americans (n = 6,587).

Statistical Analysis

Weighted percentages and means were computed to describe the socio-demographic, physical health, and mental health characteristics of the sample stratified by race/ethnicity. One-way analysis of variance was used to compare differences across groups in dimensional measures and chi-squares analyses in categorical measures. We performed pairwise chi-squares analyses to determine racial/ethnic differences between the unadjusted rates of one chronic condition and MCMC categories across different psychiatric disorders (See Table 2). Multinomial logistic regression models adjusting for socio-demographic variables (i.e., age, gender, education, marital status, and family income), BMI, and quality of life were used to examine differences in the prevalence of MCMC by race/ethnicity, psychiatric diagnosis and the interactions between race/ethnicity and psychiatric diagnosis. We adjusted for these variables because there were racial/ethnic differences across these indicators in our sample, and we wanted to isolate the relationships between race/ethnicity and psychiatric disorders and the rates of MCMC. The reference group for all models was persons with no chronic medical condition. Standard errors and 95% confidence intervals for all analyses were calculated using SUDAAN, to adjust for the effects of the complex survey design (e.g., multi-stage sampling).³⁵ Significance was set at 0.05.

RESULTS

Sample characteristics

Sample characteristics are presented in Table 1. The most common medical conditions reported included hypertension, arthritis, high cholesterol, cardiovascular disease, and diabetes. Except for diabetes and gastritis/stomach ulcer, Hispanics reported the lowest rates of all other medical conditions. African Americans reported the highest rates of diabetes and hypertension, while Non-Hispanic Whites reported the highest rates of CVD and arthritis. The unadjusted rates of MCMC were: 27.15% for non-Hispanic Whites, 27.19% for African Americans, and 17.27% for Hispanics. There were several racial/ethnic differences in the rates of past-year psychiatric disorders. African Americans reported the highest rates for any

psychiatric disorder and mood disorder. Non-Hispanic Whites reported the highest rates of any substance use disorder.

Unadjusted rates of MCMC by race/ethnicity and psychiatric disorders—Racial/ethnic differences were found in the unadjusted rates of having one chronic medical condition or MCMC in the presence and absence of psychiatric disorders (See Table 2). Among people without psychiatric disorders, the rates for one chronic medical condition and MCMC were significantly higher for non-Hispanic Whites compared to African Americans and Hispanics and significantly higher for African Americans compared to Hispanics.

A different pattern emerged among people with psychiatric disorders. No significant differences in the unadjusted rates for one chronic medical condition were observed between Non-Hispanic Whites and African Americans across all psychiatric disorders. In contrast, Hispanics consistently reported significantly lower rates of one chronic medical condition compared to non-Hispanic whites across all psychiatric diagnostic groups and to Africans Americans with any psychiatric disorder, substance abuse, and anxiety disorders. The unadjusted rates for MCMC were significantly higher for African Americans compared to non-Hispanic Whites and Hispanics with any psychiatric disorder, substance abuse, and anxiety disorders. Lastly, non-Hispanic Whites reported significantly higher rates of MCMC compared to Hispanics with any psychiatric disorder and substance abuse disorders.

Relationships between race/ethnicity, psychiatric disorders, and MCMC—We first examined the independent relationships of race/ethnicity and the presence of any psychiatric disorder (Model 1), and then the interactions of these factors (Model 2) on rates of one chronic medical condition or MCMC after adjusting for socio-demographics, BMI, and quality of life (See Table 3). Results indicate that race/ethnicity and psychiatric disorders were significantly related to the odds of either one chronic medical condition or MCMC. In Model 1, compared to non-Hispanic Whites, Hispanics reported significantly lower odds of one chronic condition and MCMC, and African Americans reported significantly higher odds of MCMC. People with any psychiatric disorder in the past 12 months reported significantly higher odds of one chronic medical condition and MCMC compared to people without psychiatric disorders. In Model 2, we examined interaction effects. Compared to non-Hispanic Whites with any psychiatric disorder, African Americans with any psychiatric disorder had significantly higher odds of one chronic medical condition and MCMC. Hispanics with any psychiatric disorder had marginal but non-significant higher odds of MCMC compared to their non-Hispanic White counterparts.

We then examined whether specific types of psychiatric disorders and the interactions between each of these disorders and race/ethnicity were related to rates of one chronic condition or MCMC after adjusting for covariates (See Table 4). In Model 1, each disorder significantly increased the odds of one chronic medical condition or MCMC. In Model 2, we found significant interactions between African American race and specific psychiatric disorders. African Americans with any anxiety disorder reported higher odds of one chronic medical condition compared to non-Hispanic Whites with similar psychiatric diagnoses. Moreover, African Americans with any anxiety or substance use disorders had higher odds of MCMC than non-Hispanic Whites with similar psychiatric diagnoses. The interactions between Hispanic ethnicity and each type of psychiatric disorder were not significant.

DISCUSSION

After adjusting for socio-demographic, BMI, and quality of life differences, we found that race/ethnicity, the presence of psychiatric disorders, and the interaction between African American race and psychiatric disorder were each significantly related to the odds of

MCMC. The interaction between race and psychiatric disorders indicates that in the presence of certain psychiatric disorders the odds of MCMC are higher among African Americans with psychiatric disorders compared to non-Hispanic Whites with similar psychiatric disorders. Lastly, the interactions between Hispanic ethnicity and psychiatric disorders were not related to the odds of MCMC. We discuss these findings below.

Compared to non-Hispanic Whites and adjusting for psychiatric disorders and all other covariates, the likelihood of MCMC was significantly higher among African Americans and significantly lower among Hispanics. This main effect for African Americans is consistent with the elevated rates of chronic medical conditions (e.g., hypertension, coronary heart disease) in this population.^{5,36,37} African Americans also experience substantial morbidities associated with chronic diseases and lower quality of medical care⁸ which could increase their risk of MCMC. The lower odds of MCMC among Hispanics are surprising given that this population reports higher prevalence rates than non-Hispanic Whites for several chronic medical conditions.⁵ However, these lower odds of MCMC among Hispanics could be due to the fact that Hispanics in the NESARC reported lower rates of several chronic conditions featured prominently in our MCMC variable (e.g., CVD, hypertension). Future studies are needed to confirm these finding in other national data sets.

Compared to people without psychiatric disorders and adjusting for racial/ethnic differences and other covariates, the odds of MCMC were significantly higher among people with psychiatric **disorders**. This main effect finding for psychiatric disorders is consistent with previous studies that have documented the elevated rates of chronic medical conditions among people with psychiatric disorders.^{12,13,38} Furthermore, the presence of a psychiatric disorder can add substantial burden to the management of chronic medical illnesses resulting in greater severity and functional limitations,¹⁵ thus placing a person at risk for MCMC.

The positive interaction between being an African American and having a psychiatric diagnosis on the odds of MCMC suggests a synergistic effect –that being in both groups at once is worse than the effect of either one alone. In contrast, the lack of a significant interaction effect between being Hispanic and having a psychiatric diagnosis suggests that each are independent factors related to the odds of MCMC. Taken together, our findings suggest that psychiatric diagnosis, Hispanic ethnicity, and African American race are each key determinants of medical comorbidity, and that race and psychiatric diagnoses may at times adversely interact to result in even greater burden than would be seen with either condition alone.

Due to the cross-sectional nature of our study, we can only speculate as to why the odds of MCMC are elevated for African Americans with common psychiatric disorders (i.e., any substance abuse disorders and any anxiety disorders) and not for Hispanics when compared to non-Hispanic Whites with similar psychiatric diagnoses. These findings suggest that the effects of being a racial/ethnic minority and having a psychiatric disorder on MCMC are not uniform across minority groups and psychiatric conditions and there may be different pathways for how the combination of these risk factors impact medical comorbidities. For example, racial and ethnic minorities and people with psychiatric conditions tend to receive suboptimal medical care that contributes to poor health. However, rates of quality of care for chronic conditions differ across racial/ethnic groups and people with mental illness with some groups receiving better care than others. For example, Druss and colleagues³⁹ recently found that among a national sample of Medicaid recipients with diabetes and mental illness being Hispanics was associated with better quality of diabetes care while being black was associated with worse quality of care. Moreover, the impact of social determinants of health, such as discrimination, stigma, and inadequate housing, are mitigated by people's social support networks, access to resources, and coping mechanism that can vary across racial/

ethnic groups and psychiatric conditions. These variations can contribute to the differential relationships of race/ethnicity and psychiatric conditions on MCM. Future studies are needed to unpack how these complex interactions influence medical comorbidities in vulnerable populations.

Our study has several limitations. The use of self-report data may underestimate the rates of MCMC and psychiatric disorders. Moreover, our indicator of medical conditions may be confounded by the use of medical care in the previous 12 months because it only includes those people who have been told by a doctor/medical provider that they have a medical condition. This criterion may miss people who might have a medical condition but did not use services in the previous year. Our MCMC variable also did not include other conditions commonly used in the calculation of MCMC rates (e.g., asthma, cancers) and does not differentiate between Type 1 and Type 2 diabetes. These conditions were not collected in the NESARC. However, our total unadjusted rate of MCMC (26%) approximates the MCMC rates (23%-28%) reported in other studies using claims data.^{2,40} The cross-sectional nature of our study prevents us from making causal inferences. We did not conduct subgroup analysis which may mask important differences in the prevalence of chronic medical conditions and psychiatric disorders within the diverse racial/ethnic populations included in our study. Future studies are needed to unpack within-group differences in racial/ethnic minority populations and consider other important socio-cultural variables (e.g., acculturations, perceived discrimination) that may help clarify how health disparities in MCMC impact these populations. Lastly, we did not investigate clusters of chronic medical conditions which may elucidate other patterns of disparities.

The identification of populations at risk for MCMC is essential for the allocation of limited health care resources, particularly as health care reform is implemented in the U.S. through the Patient Protection and Affordable Care Act (PPACA) and other state-level efforts. An emphasis of these reforms is to target health care resources towards people who use large amounts of health care, such as those with MCMC and/or psychiatric disorders, through the creation of patient-centered medical homes.⁴¹ Our findings suggest that preventive and treatment efforts for MCMC should target African Americans with and without psychiatric conditions. These efforts should focus on screening, treating, coordinating, and monitoring the physical health of these groups in both mental health and primary care settings. The integration of physical and mental health services also provide several promising approaches (e.g. lifestyle interventions, care manager programs, self-management programs) that can help improve the health of the people with MCMC.⁴²⁻⁴⁶ More studies are needed to test the effectiveness, cost-effectiveness, and cultural relevance of these approaches in racial/ethnic minority communities, particularly among those with psychiatric disorders, and how to best implement and sustain these approaches in minority communities. Lastly, environmental interventions and policies should also be considered given the evidence linking the built environment to the development of chronic medical conditions at a population level.⁴⁷ For example, the PPACA and several state initiatives support the creation of healthier communities through the funding of community transformation grants and programs. These funding mechanisms leverage existing disease prevention programs and support the development of healthy and affordable food environments and safe and attractive public spaces where people can engage in regular physical activity.⁴⁸

In all, we found that race/ethnicity and psychiatric conditions do matter in the prevalence of MCMC. Future studies are needed to replicate these findings in other national community samples. As the rates of MCMC rise in the U.S. and care for these complex medical conditions continue to consume a growing percentage of our health care resources, it is essential to identify which populations are at increased risk for MCMC and how to best direct services to address their health care needs and improve the quality of their lives.

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Table 1

Sample characteristics

	Total (N=33,107)		Non-Hispanic Whites (N=20,161)		Hispanics (N=6,359)		African Americans (N=6,587)		Chi-Square test		
	%	SE	%	SE	%	SE	%	SE	χ^2	df	P
Sex									17.44	2	<0.0001
Male	47.94	0.35	48.13	0.43	50.86	0.83	43.70	0.79			
Female	52.06	0.35	51.87	0.43	49.14	0.83	56.30	0.79			
Age, y (Mean, SD)*	48.32	0.18	49.90	0.19	41.38	0.43	45.42	0.28	232.37	2	<0.0001
Marital status									29.31	4	<0.0001
Married/living with someone	63.55	0.52	66.51	0.42	65.20	1.31	42.84	0.84			
Widowed, separated or divorced	19.16	0.27	18.96	0.33	14.40	0.81	25.43	0.72			
Never Married	17.29	0.46	14.54	0.38	20.41	0.92	31.73	0.88			
Education									30.80	4	<0.0001
Less than high school	14.01	0.49	10.06	0.32	34.75	1.55	17.61	0.73			
High school	27.96	0.51	28.21	0.57	24.42	0.85	30.11	0.90			
Some college or higher	58.03	0.63	61.73	0.73	40.82	1.38	52.28	1.22			
Family income, US\$									16.88	6	<0.0001
1–19,999	19.59	0.48	16.75	0.45	25.19	1.21	31.97	1.06			
20,000–34,999	18.99	0.34	17.46	0.40	24.75	0.77	22.77	0.65			
35,000–69,999	32.24	0.40	32.84	0.46	32.44	1.00	28.16	0.76			
70,000 +	29.18	0.73	32.95	0.89	17.62	0.92	17.09	0.94			
BMI (Mean, SD)*	27.02	0.05	26.74	0.06	27.29	0.12	28.50	0.12	126.04	2	<0.0001
BMI									17.90	6	<0.0001
Underweight	1.65	0.09	1.82	0.11	1.12	0.20	1.12	0.15			
Normal	38.10	0.40	39.93	0.45	34.73	0.98	29.84	1.09			
Overweight	36.29	0.36	36.01	0.43	39.04	0.95	35.22	0.83			
Obese	23.95	0.36	22.23	0.40	25.11	0.93	33.82	0.88			
Physician confirmed medical conditions											
Diabetes	8.14	0.18	7.57	0.20	8.50	0.54	11.45	0.45	22.42	2	<0.0001
Cardiovascular disease (CVD)	10.02	0.24	10.72	0.27	6.72	0.49	9.00	0.45	17.43	2	<0.0001

	Total (N=33,107)		Non-Hispanic Whites (N=20,161)		Hispanics (N=6,359)		African Americans (N=6,587)		Chi-Square test		
	%	SE	%	SE	%	SE	%	SE	χ^2	df	P
High Cholesterol	20.37	0.31	22.01	0.34	14.10	0.71	16.38	0.58	32.44	2	<0.0001
Hypertension	25.03	0.42	25.47	0.42	15.85	0.79	31.85	0.87	39.47	2	<0.0001
Liver disease	0.88	0.06	0.90	0.08	0.70	0.13	0.92	0.15	0.87	2	0.4248
Gastritis or stomach ulcer	6.41	0.17	6.32	0.21	7.23	0.42	6.09	0.38	1.97	2	0.1470
Arthritis	21.95	0.40	23.75	0.39	11.77	0.66	21.03	0.80	25.17	2	<0.0001
Chronic medical condition											
No chronic medical condition	51.97	0.49	49.80	0.46	65.58	0.99	51.67	1.01			
One chronic medical condition	22.10	0.31	23.06	0.37	17.15	0.64	21.13	0.63			
Two or more chronic medical	25.93	0.42	27.15	0.41	17.27	0.91	27.19	0.75			
Number of chronic medical conditions (Mean, SD) *	0.93	0.01	0.97	0.01	0.65	0.03	0.97	0.02	64.30	2	<0.0001
Health and Mental Health Related Quality of Life (SF-12) *											
Mental Health Component Score	51.44	0.08	51.55	0.09	51.74	0.21	50.39	0.20	15.61	2	<0.0001
Physical Health Component Score	50.23	0.10	50.24	0.12	51.34	0.23	49.03	0.19	34.79	2	<0.0001
Past year psychiatric disorders											
Any disorder	43.12	0.49	43.23	0.50	40.16	1.31	45.56	0.96	4.64	2	0.0131
Any substance use disorder	21.37	0.44	22.63	0.42	15.51	0.85	19.39	0.89	14.54	2	<0.0001
Any mood disorder	9.63	0.23	9.54	0.27	9.74	0.57	10.05	0.50	0.48	2	0.6229
Any anxiety disorder	15.28	0.29	15.49	0.32	13.70	0.77	15.54	0.59	1.98	2	0.1464
No psychiatric disorder	56.88	0.49	56.77	0.50	59.84	1.31	54.44	0.96	4.64	2	0.0131

Note:

* Wald F-test

Table 2
 Unadjusted rates of multiple chronic medical conditions by psychiatric disorders stratified by racial/ethnic groups

	Pairwise Chi-Squares																					
	Non-Hispanic Whites			Hispanics			African Americans			Chi-Squares			Non-Hispanic Whites vs. Hispanics			Non-Hispanic Whites vs. African Americans			Hispanics vs. African Americans			
	%	SE		%	SE	%	SE	%	SE	χ^2	df	χ^2	df	χ^2	df	χ^2	df	χ^2	df	χ^2	df	
No psychiatric disorder																						
No chronic condition	48.94	0.60	67.31	1.26	54.87	1.33	12.19***	4														
One chronic condition	22.89	0.47	17.38	0.78	19.98	0.80				24.11***	1	8.16**	1	5.32*	1							
Two or more chronic Conditions	28.16	0.53	15.31	0.97	25.15	1.06				40.00***	1	6.91**	1	38.68***	1							
Any psychiatric disorder																						
No chronic condition	50.91	0.64	63.00	1.23	47.85	1.13	13.78***	4														
One chronic condition	23.27	0.51	16.80	1.06	22.51	0.96				20.94***	1	0.50	1	14.69***	1							
Two or more chronic Conditions	25.82	0.57	20.20	1.28	29.64	0.90				12.99***	1	12.61***	1	26.99***	1							
Any substance use disorder																						
No chronic condition	55.75	0.86	70.19	1.97	48.86	1.63	10.45***	4														
One chronic condition	22.87	0.72	16.14	1.58	22.03	1.32				11.53***	1	0.32	1	8.12**	1							
Two or more chronic Conditions	21.38	0.72	13.67	1.57	29.11	1.39				15.37***	1	16.61***	1	32.10***	1							
Any mood disorder																						
No chronic condition	44.07	1.35	50.46	2.45	43.28	2.30	2.29	4														
One chronic condition	24.57	1.12	18.69	2.05	22.96	2.30				5.72*	1	0.42	1	1.83	1							
Two or more chronic Conditions	31.36	1.32	30.84	2.25	33.76	2.04				0.04	1	1.05	1	1.04	1							
Any anxiety disorder																						
No chronic condition	44.63	0.99	53.80	1.88	37.57	1.65	8.98***	4														
One chronic condition	23.25	0.79	16.98	1.62	23.87	1.64				9.82**	1	0.12	1	7.56**	1							
Two or more chronic Conditions	32.12	1.03	29.22	1.89	38.56	1.86				1.52	1	10.30**	1	10.08**	1							

Note: χ^2 = chi-square,

* p < 0.05,

**
p < 0.01

p < 0.001

Table 3

Multinomial logistic regression models for a single or multiple chronic medical conditions, by race/ethnicity and psychiatric disorder (N=32,064)

	Model 1			Model 2		
	One Medical Condition (Versus None)	Two or More Medical Conditions (Versus None)	OR (95% CI)	One Medical Condition (Versus None)	Two or More Medical Conditions (Versus None)	OR (95% CI)
Race/ethnicity						
Non-Hispanic white	1.00	1.00	1.00	1.00	1.00	1.00
Hispanic	0.80	0.71	0.89	0.81	0.70	0.82
African-American	1.06	0.95	1.18	1.14	1.01	0.96
Past year psychiatric disorders						
No psychiatric disorder	1.00	1.00	1.00	1.00	1.00	1.00
Any psychiatric disorders	1.24	1.15	1.34	1.35	1.23	1.22
Interactions of Race/ethnicity and psychiatric disorders						
Hispanic*Any psychiatric disorder	NA	NA	NA	NA	NA	0.93
African American*Any psychiatric disorder	NA	NA	NA	NA	NA	1.24

Note: NA = Not applicable. Two multinomial logit models with number of chronic medical conditions as dependent variable (0, 1, 2 or more) with 0 as the reference group. Model 1 examines main effects only. Model 2 examines interactions of race/ethnicity and psychiatric disorder. All models adjust for socio-demographics (i.e., gender, age, marital status, education and family income), BMI and quality of life (SF-12 physical and mental health component scores).

Table 4

Multinomial logistic regression models for a single or multiple chronic medical conditions, by race/ethnicity and type of psychiatric disorder (n=32,064)

	Model 1						Model 2					
	One Medical Condition (Versus None)		Two or More Medical Conditions (Versus None)		One Medical Condition (Versus None)		Two or More Medical Conditions (Versus None)		One Medical Condition (Versus None)		Two or More Medical Conditions (Versus None)	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Race/ethnicity												
Non-Hispanic white	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hispanic	0.80	0.72	0.90	0.82	0.95	0.71	0.95	0.82	0.72	0.94	0.79	0.66
African-American	1.07	0.96	1.20	1.17	1.32	1.04	1.32	1.00	0.87	1.14	1.04	0.90
Past year substance use disorder												
No substance use disorder	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Any substance use disorder	1.13	1.03	1.25	1.14	1.28	1.02	1.28	1.12	1.00	1.26	1.10	0.97
Past year mood disorder												
No mood disorder	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Any mood disorder	1.32	1.15	1.52	1.34	1.61	1.12	1.61	1.31	1.12	1.54	1.30	1.06
Past year anxiety disorder												
No anxiety disorder	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Any anxiety disorder	1.21	1.09	1.35	1.61	1.84	1.40	1.84	1.18	1.05	1.34	1.54	1.32
Interactions of Race/ethnicity and psychiatric disorders												
Hispanic*Substance use disorder	NA	NA	NA	NA	NA	NA	NA	0.90	0.66	1.22	0.84	0.56
African-American*Substance use disorder	NA	NA	NA	NA	NA	NA	NA	1.20	0.95	1.50	1.59	1.22
Hispanic*Mood disorder	NA	NA	NA	NA	NA	NA	NA	1.23	0.86	1.75	1.55	0.97
African-American*Mood disorder	NA	NA	NA	NA	NA	NA	NA	0.87	0.60	1.26	0.86	0.60
Hispanic*Anxiety disorder	NA	NA	NA	NA	NA	NA	NA	0.84	0.63	1.11	1.05	0.72
African-American*Anxiety disorder	NA	NA	NA	NA	NA	NA	NA	1.40	1.05	1.86	1.33	1.03

Note: NA = Not applicable. Two multinomial logit models with number of chronic medical conditions as dependent variable (0, 1, 2 or more) with 0 as the reference group. Model 1 examines main effects only. Model 2 examines interactions of race/ethnicity and psychiatric disorder. All models adjust for socio-demographics (i.e., gender, age, marital status, education and family income), BMI and quality of life (SF-12 physical and mental health component scores).